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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/911,083	07/24/2001	Duck Chul Hwang	1567.1016	2905

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EXAMINER

RUTHKOSKY, MARK

ART UNIT	PAPER NUMBER
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1745

8

DATE MAILED: 01/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

A28

Office Action Summary

Application No.

09/911,083

Applicant(s)

HWANG ET AL.

Examiner

Mark Ruthkosky

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 October 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 37 and 38 is/are allowed.
- 6) ☐ Claim(s) 1,3-7,11-17,19-23,26-28 and 30-33 is/are rejected.
- 7) ☐ Claim(s) 2,8-10,18,24,25,29,34-36 and 39 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Specification

The amendment filed 10/22/2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: The amended claims state that the second component solvent has a sulfur solubility of less than 20 mM and greater than 0.5mM. There is no support for the limitation that the second component solvent has a sulfur solubility greater than 0.5mM.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

The rejection of claims 1-33 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention is withdrawn. The term "high" in "high dielectric constant" and "high viscosity" is a relative term that is not defined by the claim. The specification does not provide a definition for these values, however, based on the identification of solvents in the specification, a standard for ascertaining the requisite degree by one of ordinary skill in the art would be reasonably apprised of the scope of the invention. The claims will be read in light of the dielectric constants and viscosities of the disclosed solvents as the specification does not provide a degree or limitation as to what defines "high" in each case.

Claim Rejections - 35 USC § 102

Claims 1, 3, 5-7, 11, 13-17, 19, 20-23, 26-28, and 30-33 stand rejected under 35

U.S.C. 102(b) as being anticipated by Griffin et al. (US 5,552,244.)

The instant claims are to an electrolyte for a lithium sulfur battery having a positive and negative electrode comprising a first solvent component with a sulfur solubility greater than 20 mM; a second solvent component with a sulfur solubility less than 20 mM and greater than 0.5mM; a third solvent component with a high dielectric constant and a high viscosity and an electrolyte salt.

Griffin et al. (US 5,552,244) teaches a an electrolyte for a lithium sulfur battery having a positive and negative electrode comprising a first solvent component with a sulfur solubility greater than 20 mM; a second solvent component with a sulfur solubility less than 20 mM; a third solvent component with a high dielectric constant and a high viscosity and an electrolyte salt (see claim 5 for example.) Tetrahydrofuran, ethanol, propylene carbonate and mixtures thereof are noted. Tetrahydrofuran is shown in the specification as a first solvent component with a sulfur solubility greater than 20 mM. Ethanol is shown in the specification as a second solvent component with a sulfur solubility less than 20 mM. Propylene carbonate is shown in the specification as a third solvent component with a high dielectric constant and a high viscosity. Metal salts are noted at the top of column 4 (col. 3, line 45-col. 4, line 15.) It is further noted that a mixture of water, ethanol and propylene is noted at the top of column 5. Thus, the claims are anticipated.

Claim Rejections - 35 USC § 103

Claims 4 and 12 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Griffin et al. (US 5,552,244) as applied above, and further in view of Omaru (US 5,437,945.)

Griffin et al. (US 5,552,244) teaches a an electrolyte for a lithium sulfur battery having a positive and negative electrode comprising a first solvent component with a sulfur solubility greater than 20 mM; a second solvent component with a sulfur solubility less than 20 mM; a third solvent component with a high dielectric constant and a high viscosity and an electrolyte salt (see claim 5 for example.) Tetrahydrofuran, ethanol, propylene carbonate and mixtures thereof are noted. Tetrahydrofuran is shown in the specification as a first solvent component with a sulfur solubility greater than 20 mM. Ethanol is shown in the specification as a second solvent component with a sulfur solubility less than 20 mM. Propylene carbonate is shown in the specification as a third solvent component with a high dielectric constant and a high viscosity. Metal salts are noted at the top of column 4 (col. 3, line 45-col. 4, line 15.)

With regard to claim 4, the reference does not teach the limitation that components 2 and 3 are added in a 1:1 ratio. With regard to claim 12, the reference does not teach the limitation that the electrolyte is added in a concentration of 0.5-2.0 M. Omaru (US 5,437,945) teaches an electrolyte for a secondary battery which is made of two solvent components, which correspond to the claimed second solvent component with a sulfur solubility less than 20 mM (DMC and DEC are noted as examples in col. 3 and col. 6), and the third solvent component (such as EC and PC) with a high dielectric constant and a high viscosity and an electrolyte salt (see claim 5 for example.) The electrolyte further includes a lithium salt as noted in the present invention that

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is included in a concentration of about 0.6 to 1.8 mol/L. In example 1, the mixed solvent is added in a 1:1 ratio and the concentration is 1mol/L. It is further noted that other solvents may be mixed with or substituted in the electrolyte including THF and Me-THF. It would be obvious to one of ordinary skill in the art at the time the invention was made to add solvent components 2 and 3 are added in a 1:1 ratio and the electrolyte in a concentration of 0.5-2.0 M. The mixture of solvents provides an electrolyte with a high dielectric constant and a low viscosity which will provide a high energy density and long service life over a broad range of working temperatures (see col. 3, lines 1-35.) The concentration range of the electrolyte provides for an electrical conductance sufficient to allow for good charging/discharging efficiency as taught by Omaru, (see col. 6, lines 20-55.) The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Allowable Subject Matter

Claims 2, 8-10, 18, 24-25 and 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Newly added and corresponding claims 34-36 and 39 are allowable pending the new matter objection, however, as these claims are duplicate claims of the dependent claims as noted in the applicant's arguments, the dependent set of corresponding claims must be canceled in order for these claims to be allowed. Duplicate claims may not be allowed. Claims 37-38 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

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Claims 2, 18 and 29 show specific concentrations of each component in the solvent mixture. The prior art does not teach the components in specific amounts. For example, tetrahydrofuran, ethanol, propylene carbonate and mixtures thereof are noted in Griffin et al. (US 5,552,244,) however, no specific mixtures of the three components or proportions of each element are taught. With regard to claims 8-10 and 24-25, the reference does not teach an additional additive to the electrolyte, which will form a solid electrolyte interface at the surface of the anode. As such, the claims contain allowable subject matter.

Response to Arguments

Applicant's arguments filed 10/22/2003 have been fully considered but they are not persuasive.

35 U.S.C. 112

Although the rejection under 35 U.S.C. 112 has been withdrawn, it should be noted that the mere fact that the phrases "high dielectric constant" and "high viscosity" are used in patented claims does not therefore make the instant claims definite. The phrases used in other patent applications may be defined in the corresponding specification, which removes the indefiniteness issues from the claim. In the instant application, the specification does not define the meanings of these terms.

35 U.S.C. 102

With regard to the applicant's arguments that the electrolyte of the reference may use water as a solvent in a metal-sulfur battery, the reference also names tetrahydrofuran, ethanol and propylene carbonate as excellent solvents for the electrolyte. Example 3 of the '244 patent

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shows that water is not required in the electrolyte of the Griffin invention. The '244 patent claims that the electrolyte may include propylene carbonate, ethanol, tetrahydrofuran and mixtures thereof (claim 5) as solvents for the electrolyte. Each of these solvents falls into a category of components 1-3 of the electrolyte of the instant claims and therefore, the reference anticipates the claims.

35 U.S.C. 103

With regard to the applicant's arguments that the invention of the supporting reference does not use a cation-chelated resin as the solute, this is only one embodiment of the invention. The patent teaches that the electrolyte comprises metal solutes dissolved in various polar solvents (col. 4, lines 1-23.) It is noted that the sulfur compounds of the '244 patent are optionally bonded to a polymer substrate to form a chelated resin. The Omaru reference is merely used to show that the solvents components 2 and 3 may be used in an electrolyte in a ration of 1:1 in order to transfer ions.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Examiner Correspondence

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1193. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 703-305-0587. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:00.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 703-308-2383. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Mark Ruthkosky

Primary Patent Examiner

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Mark Ruthkosky
12/26/03